

TEACHERS' RETIREMENT BOARD

INVESTMENT COMMITTEE

SUBJECT: Fixed Income –
Evaluation of the Currency Hedging Program

ITEM NUMBER: 9

ATTACHMENT(S): 2

ACTION: _____

DATE OF MEETING: May 3, 2000

INFORMATION: X

PRESENTER(S): Ms. Michelle Cunningham
Callan Associates Inc., Ms. Toni Brown

EXECUTIVE SUMMARY

Every U.S.-based investor holding assets outside the United States is confronted with the issue of how to manage the currency exposure. As per CalSTRS' Currency Hedging Program Policies, the strategic objective for the Currency Hedging Program is to reduce the risk of the passively managed segment of the non-dollar equity portfolio by establishing controlled amounts of short currency positions in approved currencies, when there is the risk that the U.S. dollar may strengthen. The performance of the Currency Hedging Program is evaluated in comparison to the MSCI EAFE Index on an unhedged basis. One of the goals and objectives established for the Investment Branch for FY 1999/00 is to evaluate the internally managed Currency Hedging Program in terms of the original objectives approved by the Investment Committee in July 1995, and to present a report on the conclusions.

As a prelude to the evaluation of CalSTRS' Currency Hedging Program, Callan Associates Inc. (Callan) prepared **Attachment 1**, which consists of a comprehensive review of the currency markets, including the size of the markets, who the participants are, and what drives movements in currencies. The review also includes an in-depth discussion of currency management considerations when designing a currency strategy and selecting a performance benchmark.

Attachment 2 represents Callan's evaluation of CalSTRS' Currency Hedging Program since its inception in July 1995. On a cumulative basis, the internally managed hedging program has added 6.53% over 4¼ years to the unhedged passively managed non-dollar equity portfolio. Furthermore, the hedging program has also lowered the standard deviation (risk) of the passively managed non-dollar equity portfolio by approximately 0.50% per annum over the same time period.

CONCLUSIONS/OBSERVATIONS

As a result of their evaluation of the CalSTRS internally managed Currency Hedging Program, Callan Associates Inc. developed the following conclusions/observations for the Investment Committee's consideration:

- 1) The program has achieved its overall objective of protecting the passively managed non-dollar equity portfolio against a rising dollar. This review did not include an analysis of the value added by each individual approved currency, but rather the impact of the Currency Hedging Program as a whole on the total portfolio.
- 2) The program would benefit from the addition to the stated objectives of reference to a specific risk measure (such as standard deviation of returns) and a defined time period.
- 3) As expected, given the objective, the program has focused on protecting the portfolio against a strengthening dollar rather than adding value as the result of a weakening dollar.



California State Teachers' Retirement System

Currency:
Overview and Management Issues

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Senior Vice President
CALLAN ASSOCIATES INC.

April 11, 2000



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Money speaks sense in a language all nations understand.

(Aphra Behn)

Just about every nation has its own national currency or monetary unit – its dollar, yen or peso – that is used for completing transactions within its own borders. Foreign currencies are required for dealings with persons or institutions outside their borders. U.S. investors buying foreign denominated securities must complete a foreign exchange transaction in order to complete the purchase. For example to purchase a Japanese stock, U.S. dollars must be sold to purchase Japanese yen, which is then used to complete the purchase of the stock. The exchange rate at which the currencies are converted is a price – or number of units of one nation’s currency that must be surrendered to acquire one unit of another nation’s currency. Because a U.S. investor owns not only the security but also the foreign currency when investing abroad, the movement of the foreign exchange rate of that currency relative to the home currency (U.S. dollar) will impact returns. Note that a glossary of terms used throughout this paper is included in the Appendix.

OVERVIEW OF THE FOREIGN EXCHANGE MARKETS

The Size of the Markets

The foreign exchange markets are by far the largest and most liquid markets in the world. Average daily turnover of foreign currencies against the dollar is estimated a \$1.7 trillion dollars up from \$1.3 trillion in 1995.¹ The chart below illustrates the percentage of turnover in 1998 represented by the major currencies.

Currency Distribution of Global Traditional Foreign Exchange Market Activity (percentage shares of average daily turnover)		
Currency	April 1992	April 1998
USD	82	87
Deutsche mark	40	30
Japanese yen	23	21
Pound sterling	14	11
French franc	4	5
Swiss franc	9	7
Canadian dollar	3	4
Australian dollar	2	3
ECU and other ERM currencies	12	17
Other currencies	11	15
Total	200	200

Source: 1998 BIS Foreign Exchange Survey²

The totals above sum to 200% because of the two sides to each foreign exchange transaction, the currency sold and the currency bought. Each transaction counts in the turnover calculation. What is evident is that the dollar is the most widely traded currency representing 87% of turnover. The widespread trading of the dollar reflects its role as an investment currency, a reserve currency at Central Banks, and its use in commodities trading (most importantly, oil).

The advent of the Euro is likely to cause structural changes in the foreign exchange markets. The magnitude and timing of these changes is related to the extent to which the Euro becomes a currency of choice for transactions and reserves. The introduction of the Euro has caused the foreign exchange markets to shrink. According to the 1998 BIS Survey, trading between prospective EMU currencies (that in 1995 represented 13% of trades) accounted for less than 6% in 1998. This was a normal consequence of the combining of 11 different currencies into one, the Euro.

The Players

Players in the foreign exchange markets can be identified as primary and secondary price makers, price takers, speculators, and central banks³. Primary price makers are professional dealers that often act on a principal basis. They will quote bid-offer prices and are willing to buy and sell large volumes. They may contact each other directly to execute trades or go through a broker (who does not act as principal). Major banks and large investment houses fall into this category. Primary price makers play a key role in the transference of risk from one entity to the other through their buying and selling activities.

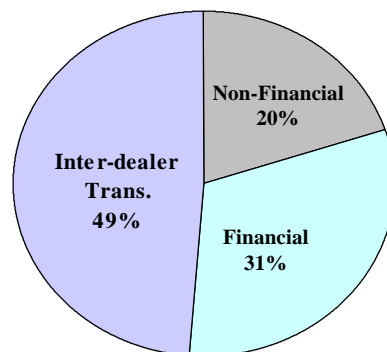
Secondary price makers include entities that make prices but do not deal on a two-way reciprocity basis. An example of this would be some banks and custodians. They solicit prices and pass them along to others without reciprocating.

Price takers are those entities that take the prices of the primary and secondary market makers and deal for their own purposes. They neither make prices nor reciprocate. Entities that fall into this category are money managers, governments, corporations and the retail public (individuals).

Speculators are in the market for purely profit motivations. They have been blamed for causing undue volatility in currency markets (most notably the Pound sterling in 1992 and the Malaysian ringgit in 1998). Regardless, they provide much needed liquidity for what may be considered as non-speculative trading activities.

All of the players discussed so far, with the exception of the price takers, are operating in the foreign exchange markets with a profit motive. Central banks are generally responsible for monetary policy and as such buy and sell their domestic currency to: monetize or not monetize debt, execute open market operations to control the supply of money, or to intervene directly in the currency markets to influence exchange rates. Central banks may intervene to maintain orderly markets or with the intention of moving the markets.

The following chart shows the composition of the market participants for U.S. foreign exchange transactions.



The categories of financial and non-financial customers includes smaller commercial banks and investment banks that do not act as dealers, firms and corporations, investment managers, pension funds, mutual funds, and hedge funds.

It is the activities of the price takers (corporate hedgers and individuals) and Central Banks that many active currency managers argue create inefficiencies in what is arguably a large and, on the surface appears to be, a very efficient market. It is these inefficiencies that they attempt to capture by active management (this will be discussed in more detail further on).

What drives movements in exchange rates?

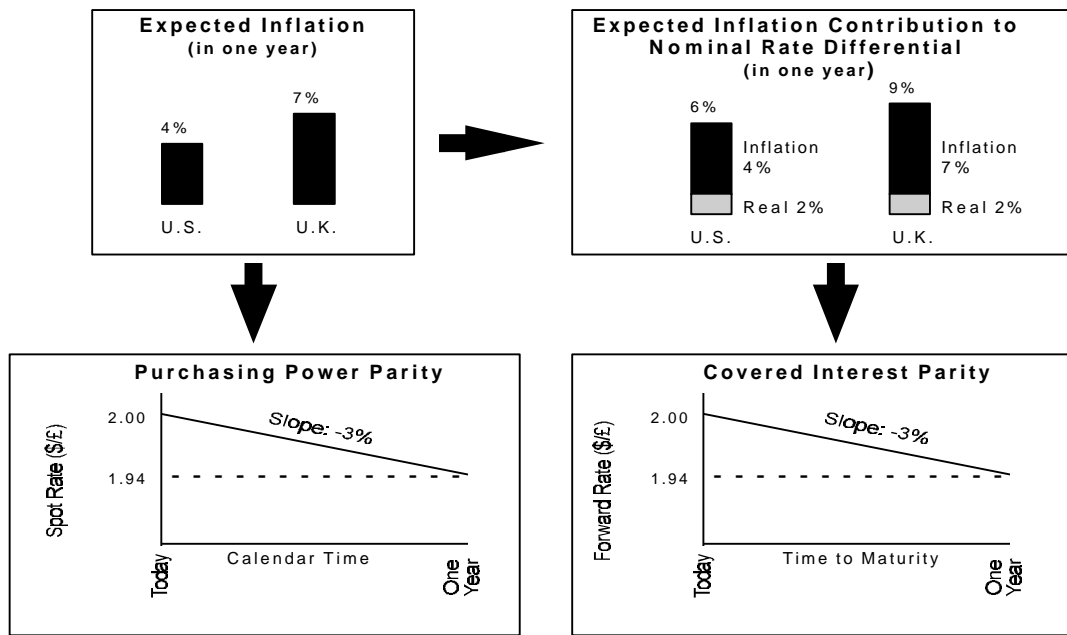
There is substantial academic research in the area of exchange rate determination, with little consensus as a result. The research generally attempts to attribute currency returns to various theories of exchange rate determination and to identify anomalies in the theories that may be exploited for profit. In a floating exchange rate environment, the driving force behind exchange rate movements is the supply and demand for a country's currency. There are many models that are commonly used to explain the behavior of foreign exchange rates, all related to supply and demand forces.

The first model, Purchasing Power Parity (PPP), relates movements in exchange rates to differences in inflation between countries. It is the theory of one price; that is, similar goods should be priced the same in all countries.⁴ If PPP holds over time, currencies will adjust to equate the price of goods from country to country.⁵ For example, if a currency has more purchasing power in one country than another, the level of imports and exports will change, affecting the supply and demand for the currency. These factors will ultimately change the exchange rate until the relative purchasing power is the same. Funds will tend to flow from high inflation (low purchasing power) countries to low inflation (high purchasing power) countries. This has the effect of depreciating high inflation currencies.

Inflation not only affects the relative prices of goods, but also interest rates. The International Fisher Effect (IFE) postulates that the relationship between the current spot rate (exchange rate) and the future rate is dependent on the ratio of nominal domestic interest rates to nominal foreign interest rates. This is important because it infers that large differences in nominal interest rates between countries, generated by differences in inflation rates, should ultimately result in the currencies moving to eliminate the differential. Theoretically, the high inflation currency ultimately depreciates by the amount of the nominal interest rate differential.

In addition to inflation and interest rates, the balance of payment flows between countries will influence their currency exchange rates. If a country imports more than it exports, experiencing a trade deficit, it will have to borrow to fund the deficit from foreign markets. This borrowing activity creates a demand for foreign currencies and ultimately results in a depreciation of the base currency. In addition to the supply and demand for goods and services, the supply and demand for financial assets also impacts exchange rates. The demand for financial assets in a country is a function of that country's monetary and fiscal policy.

The IFE has another important implication. In order to eliminate riskless arbitrage, foreign currency pricing in the forward market must be related to the difference in nominal interest rates between two countries. This is referred to as Covered Interest Parity (CIP). The forward rate is not a forecast of the future spot, but is calculated from the difference in interest rates. An example of CIP is included in Appendix A. The chart below illustrates the affect of inflation and interest differentials on the movement of exchange rates.



Source: *Global Investing - The Professional's Guide to the World Capital Markets* by Roger G. Ibbotson and Gary P. Brinson, 1993.

The upper left box illustrates a hypothetical difference between expected inflation rates in the U.K. and the U.S. Following this box down, the lower box illustrates the principle that the country with higher expected inflation should experience depreciation equal to the inflation differential, which equates to the slope of the line, to maintain PPP.

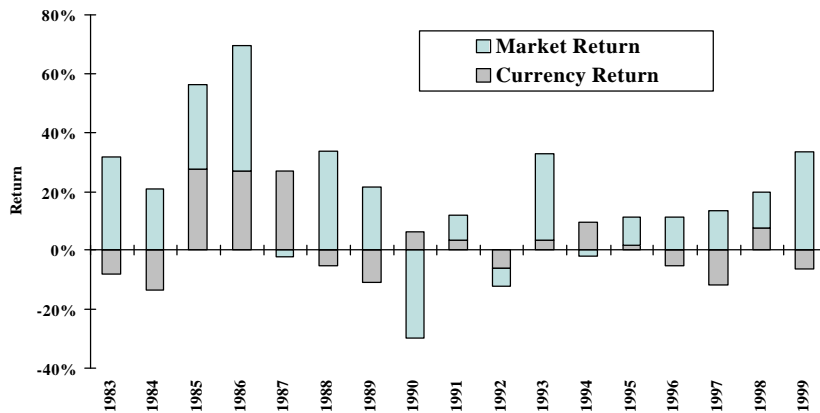
The upper right box shows the contribution inflation makes to nominal interest rates (the nominal interest rate is the sum of the expected inflation rate and the real interest rate). The lower right box illustrates the principle of covered interest parity. The slope relates to the equalization of the forward rate over time to compensate for the interest rate differential.

None of these empirical models adequately explains movements in exchange rates. Exchange rate determination is complex and is affected by many factors simultaneously which exert different influences and different times. For example, in times of global crises, all other factors affecting the dollar will be overwhelmed by the fact that it is a “safe haven” currency.

II. HISTORICAL PERFORMANCE

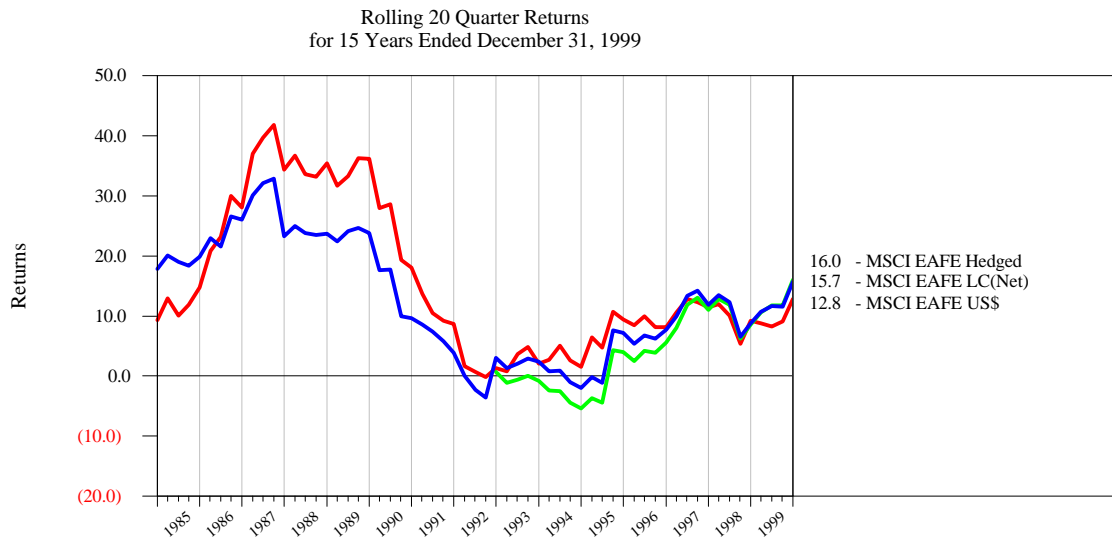
The returns from international investments to U.S. dollar (USD) based investors can be approximated by summing the local currency return (or market return) and the currency return, or the percentage change in the spot rate, versus the dollar.⁶ While this calculation is technically correct, U.S.-based investors cannot earn a local currency return, only a hedged return. The difference is essentially the interest rate differential between the home country and the foreign country. The relationships between local asset returns, hedged and unhedged returns can be found in Appendix B. Dollar value of foreign investments vary for two reasons: a change in the price of the security and/or a change in the value of the currency vis-à-vis the base currency of the investor. In many cases, factors that influence the movement of the price of a stock will not be the same as those that move the currency.

Not only can currency have either a positive or negative impact on returns of non-dollar denominated assets, but also the extent of the contribution varies over time. The chart below illustrates both the extent to which currency has contributed to returns and the variation of that contribution, period to period, using EAFE (the MSCI Europe/Australasia/Far East index). In the chart below, the total USD return is the sum of the currency return, the gray portion, and the local market return, the green portion. During periods of large dollar moves, such as 1985 and 1986, currency returns to dollar based investors were significant.

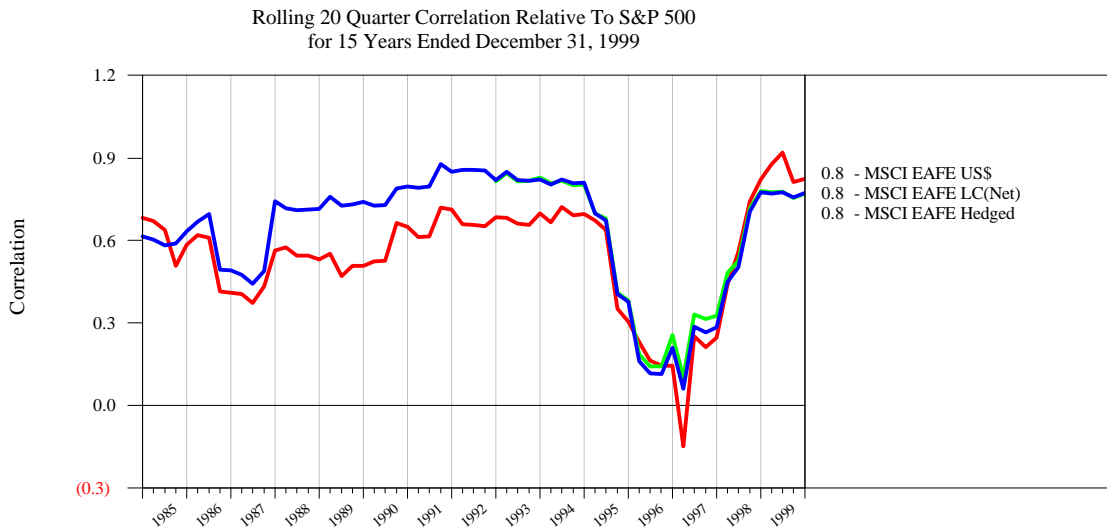


Source: Morgan Stanley Capital International

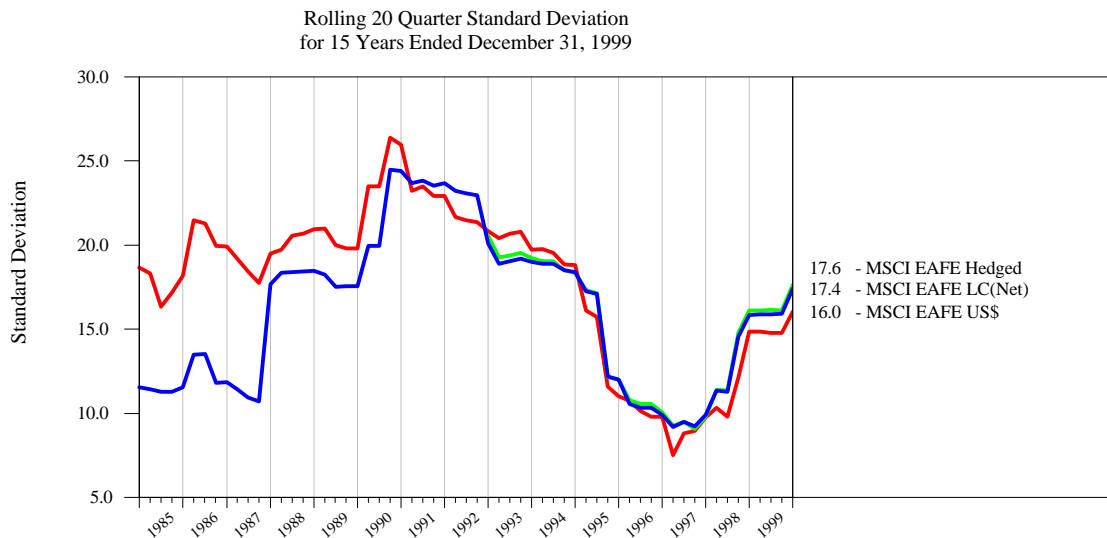
Currency returns were the only source of positive returns for U.S.-based investors in 1987. What is interesting to note is that the magnitude of currency returns is substantially reduced from those seen in the 1980's. The charts that follow illustrate the affects that currency has had on the return and risk of international equity assets on a rolling 5-year basis.



The blue line in the chart above represents unhedged EAFE returns, the green line the hedged and the red line the local currency. Local currency returns are shown as a proxy for the hedged returns which have a much shorter return history. The difference between the unhedged and hedged and/or local currency return is the result of the currency effect. In periods of dollar weakness, unhedged returns will be higher and in periods of dollar strength hedged returns will outperform. The chart below illustrates the correlation of the unhedged and hedged EAFE index to the S&P500 (a proxy for the U.S. equity market). The difference in correlation is solely due to currency.



Correlation matters in that one of the primary reasons U.S. investors invest in equities overseas is to provide diversification to their U.S. equity assets. If correlation increases as a result of hedging, the diversification benefit of holding non-dollar equity is reduced. What this chart shows, however, is that the effect currency has on the correlation of non-U.S. equity to U.S. equity varies over time. This occurs because the correlation that the EAFE basket of currencies has to the underlying equities also varies over time.



Likewise, currency also affects volatility. As can be seen in the chart above, there are times when currency has increased the risk (volatility) of international equity and times when it has reduced it. Again, this is related to the correlation that currencies have with the underlying equities.

III. CURRENCY MANAGEMENT CONSIDERATIONS

Hedging Basics

Before beginning a discussion on the implications currency has on asset allocation and the determination of an appropriate strategic allocation, or benchmark determination, a review of the mechanics of hedging and the types of exposures that are generally hedged is appropriate. In hedging international equity portfolios, the goal is to protect the translated value (that is, the U.S. dollar value of securities denominated in a foreign currency) over an open-ended period of time. This differs from the hedging of a transaction where the cash flows and timing are known in advance. The most common instruments used when hedging are futures, forwards and options. A description of each and their respective characteristics are included in Appendix C. A security denominated in a foreign currency would be hedged to protect against a decline in that currency relative to the U.S. dollar. An example of how a hedge works is shown in Appendix D. Because equities are long duration securities and the instruments used to hedge them are short, a mismatch in cash flow is created. The gains/losses from currency hedging are settled in cash whereas currency translation gains/losses associated from holding foreign denominated securities are not realized until the security is sold. A summary of these cash effects can be found in the table below.

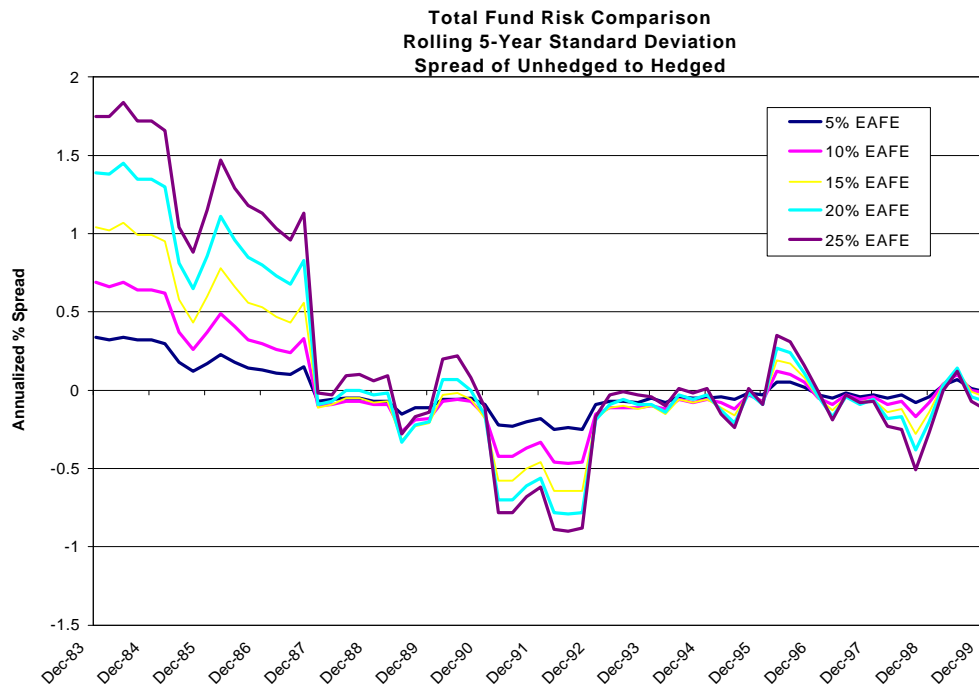
	Foreign Currency Appreciates	Foreign Currency Depreciates
Foreign Assets	Unrealized Translation Gains until Assets Repatriated	Unrealized Translation Losses until Assets Repatriated
Currency Hedge	Realized FX Losses Settled in Cash	Realized FX Gains Settled in Cash
Short-Run Impact on Portfolio Cash Flow	Cash Outflows	Cash Inflows

Source: Currency Management: Concepts and Practices. Clarke and Kritzman.

This asymmetry in the realization of gains and losses can present challenges for the management of cash flows of the portfolio. Gains and losses from hedging should not be isolated from the movement of the underlying assets. This could lead to a misinterpretation of the success of the hedging program and lead to poor decision making in further currency hedging.

Effects of Currency on Total Fund Risk

While it has been shown that currency can contribute to the risk of international equity assets, the effect on the total fund risk must be considered as well, especially in regards to setting an appropriate hedge benchmark (or strategic allocation to currency). The chart below illustrates for a simple fund containing 60% U.S. equity (represented by the Russell 3000) and 40% fixed (represented by the Lehman Government/Corp) the contribution that currency makes by increasing amounts of non-U.S. equity to the asset mix.



The currency contribution was isolated by calculating rolling 5-year standard deviations for plan mixes adding unhedged EAFE and subtracting the same plan mixes utilizing EAFE hedged. The fixed income component remains the same. What can be seen is that adding currency exposure through higher international allocations can increase total fund volatility (as in 5-year periods ending between 1983-1987) or it can lower it (between 1990-1993). The implication of this is that hedging does not always reduce the risk that international assets contribute to the volatility of the total fund.

Designing a Currency Strategy:

With all the apparent disagreement about currency management, what should plan sponsors should be thinking about when pondering the merits of managing currency exposures in international asset classes? For starters, currency management can take on subtle forms. For example, if a plan sponsor, either directly or through their international asset managers, employs active country allocation, it could be argued that they are making active currency decisions vis-à-vis their benchmark. If you own international assets, you own foreign currencies. What a plan sponsor subsequently decides to do with that exposure is the subject of the following discussion. Given the potentially significant contribution to the risk, return and correlation of international assets, the decision of currency management should not be made by default, but by design.

The Policy Decision

Currency management should be a conscious decision on the part of plan sponsors, regardless whether the ultimate decision is to hedge or not to hedge. The appropriate amount to hedge, if any, will depend on many factors including currency's impact on the risk, return and correlation of existing assets. Since currency hedging may impact returns and the diversification benefits of international assets (e.g., raises the correlation to U.S. assets), hedging becomes a trade-off, balancing the costs of risk reduction with a modest reduction in diversification. A sound hedging policy should take into account such factors as the plan's liabilities, funded status, corporate risk, investment objectives, and any view of future currency movements.

Ideally, the currency policy decision is made simultaneously with the allocation to the international asset class. The policy determination is the step that develops the strategic allocation to currency. Plan sponsors should investigate and prioritize the measures of risk that are most relevant in the context of the total plan. Some potential measures of risk include:

- standard deviation of returns - long-term or short-term;
- liquidity - cash flows from hedging;
- downside loss; and
- peer group risk.

Once the risk factors have been identified, the currency management strategy should directly address those risks. The object for the plan sponsor is to minimize their maximum regret, whatever that may be. Central to establishing a currency policy is the determination of the appropriate hedge benchmark. The section on strategy determination will address how currency can be managed once the benchmark has been established.

Selecting a Benchmark

Currency exposures in a portfolio may be fully hedged (all non-dollar exposure removed), unhedged (all foreign currencies held), or something in between. There is an abundance of literature surrounding the choice of an appropriate hedging policy. The most notable paper advocating a fully hedged posture was Andre Perold and Evan Schulman's 1988 paper, "The Free Lunch in Currency Hedging."⁷ The paper proposed that since currency was a zero sum game, what you gain is someone else's loss; fully hedging reduces volatility without any loss of expected return. This set off a wave of fully hedged benchmarks. The paper has subsequently been criticized for the time specific nature of its conclusions. Kenneth Froot's 1993 paper challenged the academic view that currency should be 100% hedged.⁸ He argued that currency hedging over long time horizons might indeed increase risk without increasing return. The limitation of this analysis is that plan sponsors concerned with volatility and the funded status of their plans, may have a different time horizon.

In 1988, Fisher Black introduced the "Universal Hedging Policy" which advocated a 77% hedge ratio.⁹ Black's formula resulted in three rules: hedge foreign equity, hedge less than 100%, and hedge equities equally across all currencies. He basically proposed that hedging was not a zero sum game, that is, investors could increase their expected return by holding currencies.

While the academic literature outlines many of the relevant issues, plan sponsors must consider a variety of other factors as well. Some of the key issues a plan must consider when analyzing the appropriate hedge ratio, or benchmark, are: 1) the size of the international allocation relative to other assets, 2) the cost/benefit trade-off of currency hedging, and 3) the ability of currency to be segregated from the underlying assets and managed separately.

While the currency literature generally concludes that there is a minimum international allocation at which it makes sense from a cost standpoint to hedge, the plan must consider its own attitude toward risk, the absolute dollar allocation to foreign assets, and the costs of hedging when formulating a currency policy. A plan with a more aggressive asset allocation, for example a 70%/30% stock/bond mix, may have a higher tolerance for risk and may, therefore, find a partial hedge ratio optimal. The table below summarizes some of the most commonly used hedge ratios/benchmarks and their general characteristics. Generally, these benchmarks are applied universally (that is, each currency in the portfolio is given the same benchmark).

Hedge Ratio/ Benchmark	Return Bias	Potential for Volatility Reduction	Cash Flow Impact
0% Hedged	Weak Dollar	Low	Low
50% Hedged	Med/Strong Dollar	Medium	Medium
100% Hedged	Strong Dollar	High	High
Put Option*	Strong Dollar	Downside Risk Protection	Differs

**A put option benchmark is the goal of obtaining an asymmetrical payoff, limiting downside risk when the dollar rises, but keeping most of the upside potential when the dollar falls.*

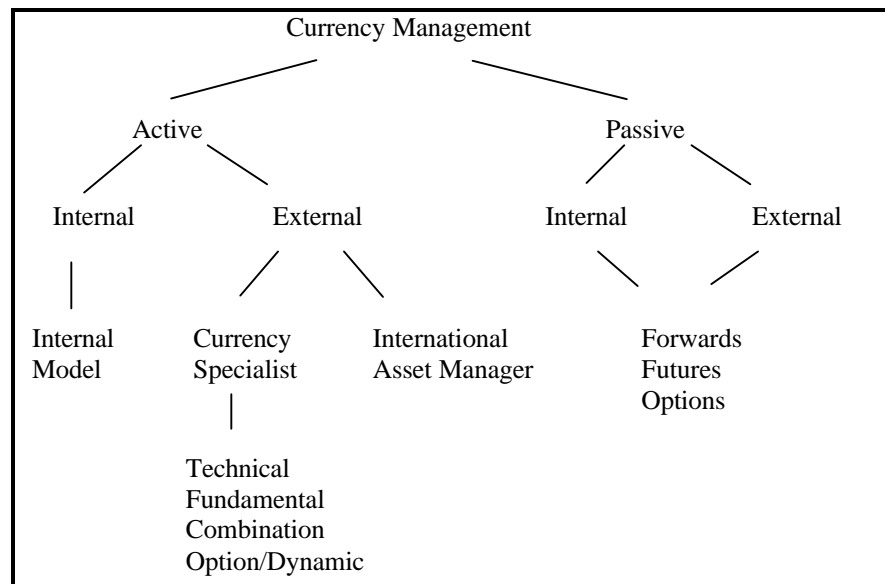
The return bias column summarizes the dollar environment under which each benchmark will best perform. The volatility column addresses whether or not the benchmark contributes to the reduction of the standard deviation of the asset class. The cash flow column identifies the degree to which cash would be required under each scenario. If hedging is conducted, cash will either be required periodically to settle hedges or will be generated from hedging. All of these benchmarks may be managed actively or passively. The 0%, 50% and 100% hedged benchmarks can be implemented passively by executing forward contracts. The option benchmark can be achieved passively by purchasing a put option on a currency (or group of currencies).

Some generalizations about benchmarks may be drawn from the chart above. A 100% hedged benchmark will be most appropriate to a plan whose primary concern is risk reduction, is less sensitive to the issue of cash flow, and/or believes that the dollar is positioned for a rise. A 0%, or unhedged, benchmark is appropriate for a plan less concerned about volatility, more sensitive to the cash flow issues, and/or believes the dollar is in a long-term decline. A partially, or 50%, hedged benchmark has the advantage of minimizing the regret that may arise from a hedged or unhedged position. The disadvantage is that as a compromise position, it is never perfectly right, where the polar positions (0% or 100% hedged) have this potential. Free at-the-money options would theoretically provide the perfect payoff structure for plan sponsors -- capture all the gain when the foreign currencies rise and have no loss when currencies fall. Options are available on major currencies and can be grouped into a basket to replicate an underlying exposure. Unfortunately, options are not free. As a result, the cost and liquidity of options must be balanced against the amount of protection desired. Dynamic hedging strategies attempt to replicate the asymmetrical payoff of options (limited downside and unlimited upside) at a savings to the outright purchase of options.

Once the goals of currency management have been clearly identified, the plan sponsor will have a better idea of which benchmark fits their needs. A mean variance framework is frequently used to arrive at the appropriate benchmark; while it provides useful information, it is very sensitive to the inputs.

Implementing a Hedging Program

The chart below outlines the choices available to plan sponsors when considering a hedging program.



The first issue that needs to be addressed, after the appropriate hedge ratio/policy benchmark has been determined, is whether currency should be managed actively or passively. The active/passive issue hinges on if the plan sponsor believes currency can be separated from the underlying asset and managed profitably. An additional factor related to the successful management of currency surrounds the issue of market efficiency. If the markets are efficient, the case where all available information is reflected in the price, then there should be little to gain by active management. Arguments for market efficiency note the size and liquidity of the markets, the free flow of information, and low transaction costs. Arguments for inefficient markets include the fact that information is costly and, therefore, not equally distributed and that market participants are not similarly motivated (for example, corporate treasuries and central banks). If a sponsor has a view that the currency markets are inefficient and that currency returns can be separated and managed profitably, active management may be a viable option. The following discussion attempts to identify how active currency managers endeavor to add value.

How do Active Managers Add Value?

Active management can add value if the bets incurred are rational in theory and succeed in practice. Active managers attempt to add value by capturing three main anomalies in the foreign exchange markets: mispricings from equilibrium PPP, the forward rate bias,¹⁰ and trending. Given frictions, for example tariffs and quotas, involved in the transfer of goods and services, it is not surprising that over the last decade there are documented, consistent violations of PPP.¹¹ Mark Kritzman has researched the forward rate bias and found that forward rates systematically and significantly overestimated the subsequent change in future spot rates.¹² If active managers can identify the magnitude of the bias, they can generate returns. Currencies have exhibited a large degree of trending in the past, and if managers can identify the direction and magnitude and direction of a trend early enough, they can add also value.¹³

The goal for active management is to add value relative to a benchmark, typically not to reduce risk. The risk issue should have been considered in the selection of the benchmark. Therefore, a currency manager's performance should be measured as excess return to the benchmark, keeping mindful of the risk associated in generating this excess return.

The question of whether or not active managers have been able to add value has been addressed recently in a study conducted by Brian Strange.¹⁴ Some of the challenges facing plan sponsors and consultants when evaluating the performance of overlay managers is the different set of exposures, constraints, currency bases and benchmarks that each has which makes comparisons difficult. The study attempted to neutralize the effect of benchmarks, constraints, etc. and evaluate the pure value added utilizing performance data from 11 active currency management firms (a total of 152 accounts). Each of the firms provided the total return, the benchmark return and the value added/detracted by the manager versus the benchmark quarterly. The analysis concluded that the participating managers added an average of 44 basis points per quarter over a five-year period. While this is the most comprehensive study to date, because the managers chose the accounts to submit and a select group of managers participated, there is the potential for survivorship and selection bias.

IV. CURRENCY MANAGEMENT OPTIONS

Some additional considerations when contemplating active currency management are: whether the program is managed internally or externally and the availability of staff to manage the program. The table below summarizes some of the relevant issues for the various options.

	External		Internal	
	Currency Specialist	International Equity/Fixed Manager	Active	Passive
Management Fees	20-40 basis points	No additional fees	Internal staffing and system costs	Internal staffing and system costs
Ease of Admin.	Complex	Easy	Complex	Easy
Currency Expertise	Yes, presumably	Sometimes	Need to develop if don't have	Need trading expertise
Potential for Added Value*	Yes, accountability for returns	Yes, may be limited	Yes, accountability for returns	None

* To a passive benchmark.

As can be seen above, there are pros and cons to each option. The pros of active management include accountability and potential for value added. The disadvantages are the additional fees, layer of active management risk, and complexity of administration.

Turning to the asset manager, historically foreign bond managers, not equity managers, have developed in-house currency management expertise. International equity managers may manage currency risk implicitly through country and stock selection and explicitly through currency hedging. A disadvantage of separating the currency management from the underlying assets is the possibility of the currency manager unwittingly negating a currency decision imbedded in an equity position.

For plans with limited internal resources available to manage a currency program, having an internally or externally managed passive hedge, or having the equity/fixed income managers hedge, is a cost effective alternative.

Performance Benchmark for Active Managers

There are two components to a currency benchmark -- the hedge ratio (or the percentage of the total allocation to be hedged) and the mix of currencies subject to the hedge. When it comes to what is hedged, the plan has essentially two options. The first option is to hedge the actual exposures created by the underlying equity exposure. The second is to hedge to an externally determined mix of currencies such as EAFE or a normal target mix, which may differ from the actual underlying exposures. The former represents the active manager's tactical positions from a benchmark and the latter the strategic or target allocation.

Option	Pros	Cons
Actual Currency Exposures	<ul style="list-style-type: none">• Results correlate with underlying exposures• Little chance of net long or short positions	<ul style="list-style-type: none">• Actual exposures are a result of asset selection and may not be optimal• Administration is important- exposures must be available on a timely basis• Customized benchmark maintenance
External Benchmark	<ul style="list-style-type: none">• Shifts by underlying asset managers have no bearing• Better performance tracking to benchmark (EAFE)• Returns are externally verifiable	<ul style="list-style-type: none">• Net currency mix not monitored, may end up net long or net short• Could get unrelated currency exposures, not actually hedging current allocation

To illustrate the importance of this issue, consider an equity manager that chooses to significantly underweight Japan relative to a benchmark weight. This not only creates an underweight of the country relative to the benchmark, but also creates an underweight to the currency. The success of this deviation will depend on the relative performance of the stock, country, and currency relative to the benchmark. (The manager may be out of the country for currency or stock reasons.) If the stock and/or country underperforms but the currency does well, then the total performance is sub-optimal. *Total performance is the bottom-line, therefore, at the fund level, currency management success should not be measured in isolation but combined with the underlying asset performance.*

V. What are other plans doing?– Peer Group Survey

Callan conducted an informal survey of 7 public and 9 corporate pension funds with assets ranging from \$300 million \$171 billion to on their views of currency overlay.

Characteristics:

- Average equity allocation was 65% (range 33-88%)
- Average international equity allocation was 20% (range: 9-25%)
- Half (8) indicated that they explicitly address currency, 6 corporate and 2 public funds
 - ⇒ Implementation: 2 through internally run programs, 5 with currency specialists and one with their international equity manager.
 - ⇒ All eight of the funds ranged in size from \$4-\$171 billion and had allocations in excess of 15% to international equity (average of 21%)
 - ⇒ Benchmarks: 4 had 50% hedged benchmarks, 3 unhedged, and 1 fully hedged.
 - ⇒ Why overlay: 3 indicated that risk was the primary reason, 4 indicated both risk and return, and one (with a 50% hedge benchmark) stated that it was to have a neutral view on the dollar

- 8 funds indicated that they do not explicitly address currency management, 5 public and 3 corporate funds (these funds ranged in size from \$300 million to \$27 billion)
 - ⇒ Average international allocation of these is 18.5%
 - ⇒ all indicated that they allow their underlying equity managers to hedge opportunistically
 - ⇒ reasons for not explicitly addressing currency: currencies wash over the long run, don't understand risk/rewards of overlay, rather have equity manager deal with it

On balance, it appears that the larger the fund and the larger the international equity allocation, the more likely they are to consider currency explicitly. However, there still seems to be a view that currency washes over time and a skepticism over whether or not currency overlay managers can really add value.

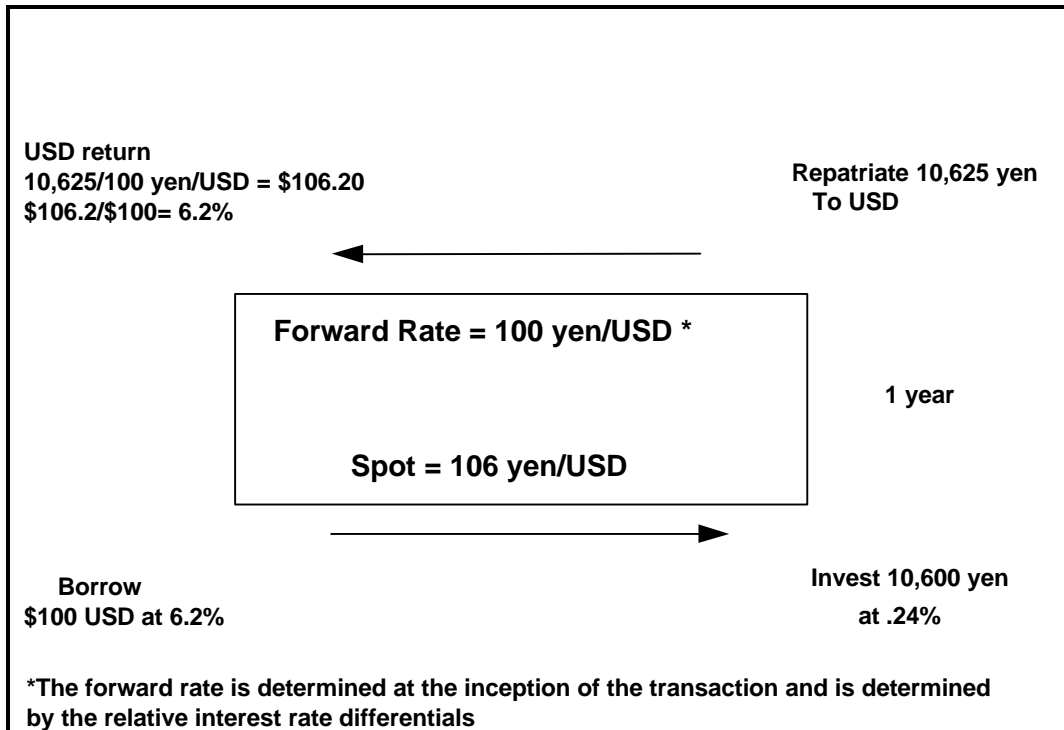
VI. SUMMARY

Every U.S.-based investor holding assets outside the United States is confronted with the issue of what to do with the currency exposure. Currencies will periodically add and reduce volatility to the total asset allocation of a fund. Many argue since the markets are so large and apparently efficient that there is little to be gained from actively managing currency. Others argue there are anomalies that are created by non-profit oriented participants that create opportunities for currency management to add value. At a minimum, funds should formally review and document their views regarding currency in a policy statement. In the end, plan sponsors must consider their risk tolerance, beliefs concerning the efficacy of active management and implementation issues when deciding the appropriate methodology for managing currency.

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- ¹ Average daily turnover, net of local inter-dealer double counting.
- ² As published in "The Future of the Foreign Exchange Markets" by Janet Lewis. Figures are adjusted for both local and cross-border double counting.
- ³ Bishop, Paul; Dixon, Don, *Foreign Exchange Handbook*, McGraw Hill 1992, pp. 125-132.
- ⁴ *The Economist* annually calculates the PPP value of the dollar based on the price of Big Macs around the world. It is a simple, but effective, illustration of the concept of purchasing power parity.
- ⁵ The future spot rate will equal the current spot rate times the ratio of the percentage change in the price of the commodity, in the home currency, divided by the percentage change in the price of the commodity in the foreign currency.
- ⁶ The actual calculation is $R_s = (1 + R_{LC})(1 + e_i) - 1$ where R_s is the U.S. dollar return, R_{LC} is the local currency return of the market, and e_i is the rate of appreciation/depreciation of the foreign currency relative to the dollar. The change in spot is calculated by comparing the spot rate from the beginning of the period to the spot at the end of the period.
- ⁷ Perold, Andre and Schulman, Evan, "The Free Lunch in Currency Hedging: Implications for Investment Policy and Performance Standards," *Financial Analyst Journal*, May-June, 1988.
- ⁸ Froot, Kenneth, "Currency Hedging Over Long Horizons," *National Bureau of Economic Research, Inc.*, Working Paper No. 4355, 1993.
- ⁹ Black, Fisher, Universal Hedging: "Optimizing Currency Risk and Reward in International Equity Portfolios", *Financial Analyst Journal*, July-August, 1989.
- ¹⁰ The fact that the forward rate has systematically overestimated the subsequent change in the future spot rate.
- ¹¹ Hakkio, Craig S., "Is Purchasing Power Parity a Useful Guide to the Dollar?", *Economic Review, Federal Reserve Bank of Kansas City*, Third Quarter 1992.
- ¹² Kritzman, Mark, "The Forward Rate Bias", *Currency Risk in Investment Portfolios*, AIMR Conference Proceedings, 1999.
- ¹³ Kritzman, Mark, "Serial dependence in currency returns: Investment implications", *Journal of Portfolio Management*, Fall 1989.
- ¹⁴ Strange, Brian, "Currency overlay managers show consistency", *Pension & Investments*, June 15, 1998.

Appendix A

COVERED INTEREST RATE PARITY

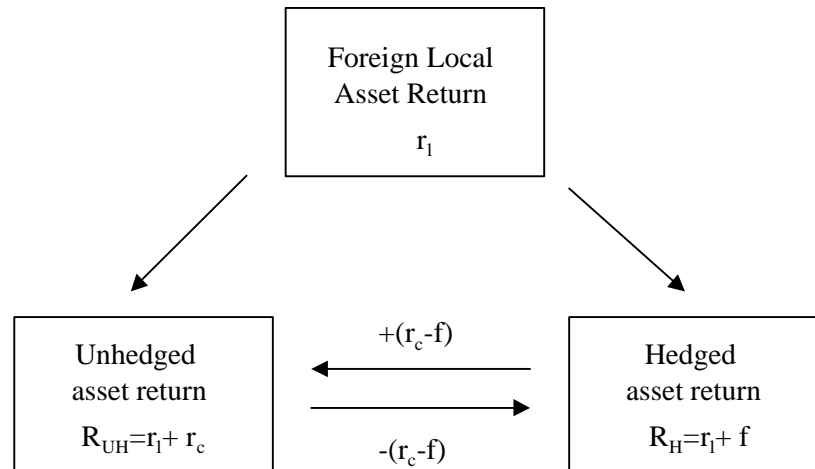


This chart illustrates how the pricing of yen to the USD in the forward market is related to the interest rate differential between the U.S. and Japan.

1. First, borrowing \$100 and buying yen at the current spot rate of 106 yen/USD results in 10,600 yen. The 10,600 yen is invested in Japan at an interest rate of 0.24%.
2. After a year, the balance would be 10,625 yen ($10,600 \times 1.0024$). In the conversion of the yen to dollars, the balance is now exposed to any fluctuations in the spot rate that may have occurred over the year. If the spot rate is the same after 1 year, then the investment would have earned 0.24% ($10,625 \text{ yen}/106 \text{ yen/USD}$), the Japanese 1 year interest rate. If the spot rate changed, then the return would have differed by the amount of the change in the spot rate.
3. In order for this investment to be riskless, the initial investment would have to have been hedged by selling yen forward at a rate which would equate the U.S. interest rate to the Japanese interest rate – 100.0 yen/USD. When 10,625 yen is converted back to dollars at the forward rate, the investment returns 6.2%, the U.S. interest rate.

Appendix B

RELATIONSHIP BETWEEN HEDGED AND UNHEDGED ASSET RETURNS



R_l =return of foreign asset expressed in local currency terms

R_{UH} =return of foreign asset expressed in home currency terms

r_c =currency return (percentage change in exchange rates using the home currency/foreign currency convention.

f =forward premium or discount a hedger receives (pays) to hedge the foreign currency risk. It is a function of the difference in interest rates between the home currency and the foreign currency.

Note: These relationships are approximate.

Source: *Currency Management: Concepts and Practices, The Research Foundation of the Institute of Chartered Financial Analysts. Roger Clark and Mark Kritzman, 1996.*

Appendix C

TYPES OF INSTRUMENTS USED IN HEDGING

	Forwards*	Put Options	Range Forward
Description	A contract to buy or sell a specified amount of currency forward at a specific rate to a specific date	Purchase the right but not the obligation to sell currency at a pre-specified rate on a pre-determined date	A purchase of a put option and sale of a call option (with a higher strike) creating a collar.
Advantages	<ul style="list-style-type: none"> • No up-front cash outlay • Highly liquid markets • Can be used on individual currencies or a basket 	<ul style="list-style-type: none"> • Benefit from foreign currency appreciation 	<ul style="list-style-type: none"> • No up-front cash outlay • Downside protection • Get some up-side when foreign currencies appreciate
Disadvantages	If fully hedged, forfeit gain from foreign currency appreciation	Can be expensive depending on level of protection desired	Sell off of some upside to finance downside protection
Payoff Structure	Symmetric – responds to positive and negative moves in the currency the same	Asymmetric – responds differently to positive and negative moves in currency	Asymmetric

**This would also apply to futures. Futures are less flexible in general than forwards. They come in standardized contract sizes and maturities and require margin deposits and daily mark to market while forwards do not.*

Appendix D

SAMPLE OF HOW A HEDGE WORKS

	<u>USD</u>	<u>Pounds</u>
<u>No Hedge</u>		
<i>At time 0</i>		
Buy 100 shares of Glaxo Wellcome for £1,786	(\$3,572)	£1,786
spot = \$2 USD/pound		
<i>After one year</i>		
Sell 100 shares of Glaxo Wellcome for £1,786	1,786	(1,786)
spot = \$1 USD/pound		
Total Gains (Losses)	<u>(\$1,786)</u>	<u>0</u>
 <u>With Hedging</u>		
Buy 100 shares of Glaxo Wellcome for £1,786	(\$3,572)	£1,786
spot = \$2 USD/pound		
Sell 1,786 pounds forward Buy dollars forward rate = \$1.85 USD/pound		
Sell 100 shares of Glaxo Wellcome for £1,786	1,786	(1,786)
spot = \$1 USD/pound		
Gain (loss) forward contract	<u>1,518</u>	
Total Gain (Loss)	\$(268)	

Note: Total loss is a result of the forward points which are never recaptured.

Currency Return: The percentage change in the spot exchange rate.

Currency Option: A contract that gives the buyer the right, but not the obligation, to buy (or sell) a specified amount of one currency for another at a specified price on (or in some cases before) a specified date. A call (put) option is the right, but not the obligation, to buy (sell) the underlying currency.

Dynamic Hedging: A technique of portfolio insurance or position risk management in which an option-like return pattern is created by increasing or reducing the position in the underlying (or forwards, futures, or options on the underlying) to simulate the delta change in value of an option position.

Exchange rate: The number of units of one nation's currency that must be surrendered in order to acquire one unit of another nation's currency

Forward foreign exchange rate: The rate the market offers if the conversion is agreed to now but actual conversion is deferred to some point in the future.

Forward points: The difference between the spot exchange rate and the forward rate (also referred to as the swap rate).

Forward premium/discount: When the forward points are expressed as a percentage of the current spot rate. If the forward rate is greater (less) than the spot rate it is a premium (discount).

Spot foreign exchange rate: The rate used to convert the home currency at the present time as opposed to sometime in the future.

SECTION IV – CURRENCY PROGRAM OVERVIEW

**CALIFORNIA STATE TEACHERS RETIREMENT SYSTEM
CURRENCY PROGRAM REVIEW**

Overview of Program:

The internal currency overlay program was approved by the Board in July 1995. The stated objective of the program is to “reduce the risk of the passively managed segment of the non-dollar equity portfolio by establishing controlled amounts of short currency positions in approved currencies when there is a risk that the U.S. dollar may strengthen.” The performance of the program is measured against the MSCI EAFE Index on an unhedged basis. Up to 50% of the total market value of the passively managed segment of the non-dollar equity portfolio may be hedged. Approved currencies are the Euro, Japanese yen, Swiss franc, and Pound sterling. Only currency forwards (with a maximum of 6 months maturity) are utilized to implement the program.

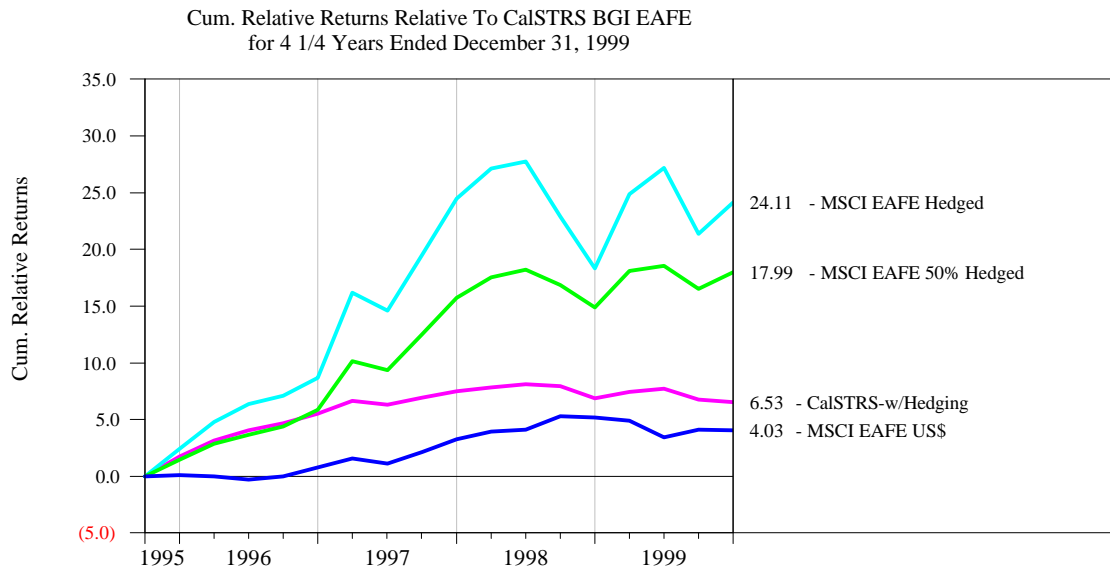
The hierarchy for decision-making for the Currency Hedging Program is as follows:

CalSTRS Board:	Establishes Policy
Chief Executive Officer:	Approves Procedures
Chief Investment Officer:	Establishes Program Guidelines/Reviews Desk Manual
Director of Fixed Income:	Oversees Policy/Procedure Implementation
Investment Officer:	Implements program
Investment Officer:	Reviews Program Activity and Provides Internal Reporting

The process for the determination of the hedge ratio for each approved currency is a discussion between the CIO and the Director of Fixed-Income on a regular basis. Inputs include international active equity manager views/actions, street estimates of future spot rates, and relevant economic and macroeconomic data.

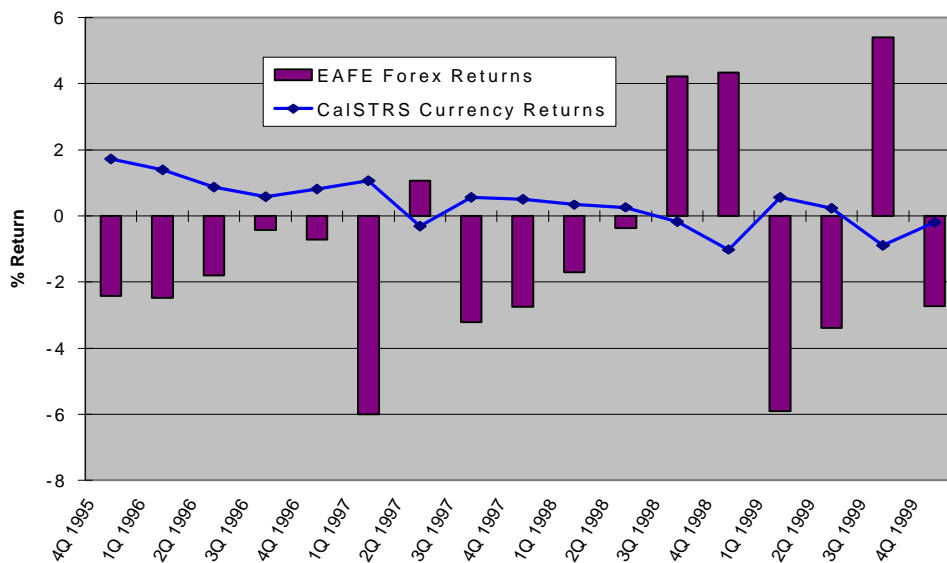
Performance

The following chart shows the cumulative performance of the CalSTRS international equity program with the hedge relative to the CalSTRS BGI mandate. The MSCI EAFE index unhedged, 50% hedged, and 100% hedged are shown for comparison purposes. The baseline (zero line) in the chart below represents the CalSTRS BGI EAFE portfolio.



On a cumulative basis, the hedging program has succeeded in adding 6.53% over 4 1/4 years to the unhedged BGI international equity mandate. (These charts exclude 2 months of data prior to the 4th quarter of 1995).

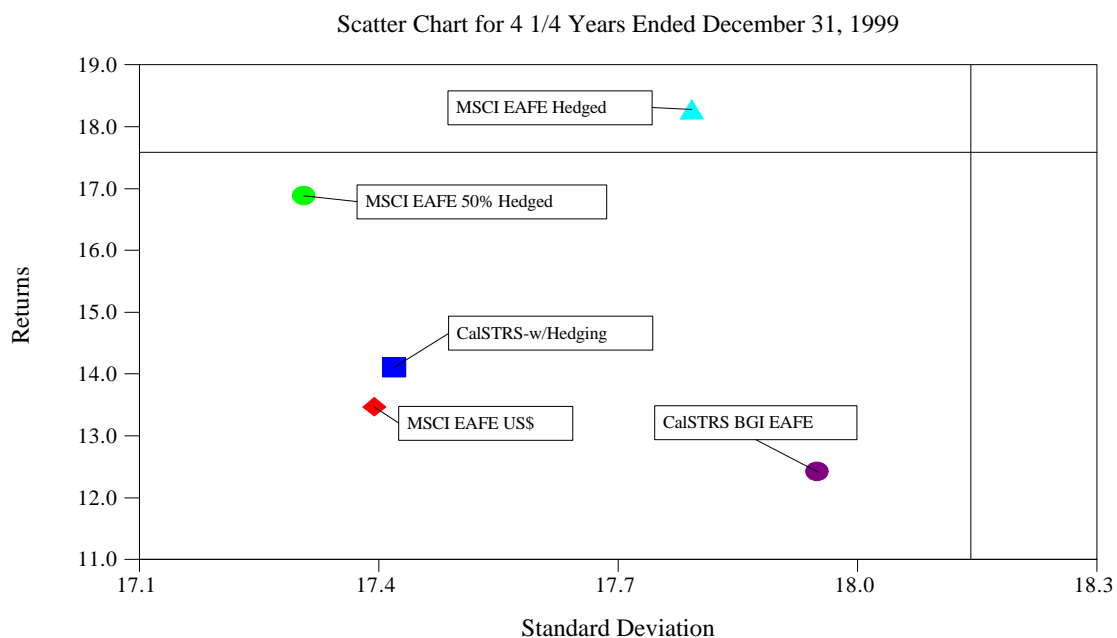
The following chart shows on a quarterly basis the performance of the Currency Hedging Program relative to the currency returns on an EAFE basket of currencies. (A group of currencies represented by those countries in the MSCI EAFE index.)



The EAFE Forex return was calculated by subtracting the EAFE index hedged from the EAFE index unhedged. The difference is the currency return available to be captured from hedging. In periods where the return is negative (a strong dollar environment) it would have been better to be hedged. Conversely, where the returns are positive (a weak dollar environment) it would have been better to be unhedged.

What this chart illustrates is that the Currency Hedging Program has been successful in achieving its stated objective of protecting the international equity assets against a strengthening dollar and avoiding currency losses. The currency program has detracted slightly from returns in periods of dollar weakness.

The following chart illustrates the performance of CalSTRS and the indices in a risk/reward chart.



(The crosshair represents the risk and return of the median manager in Callan's non-U.S. Equity style group).

This chart shows that the Currency Hedging Program has not only been successful in adding return but has also lowered the standard deviation (risk) of the of the BGI international equity portfolio by about 0.50% per annum over this time period.

Conclusions/Observations

- ◆ The program has achieved its overall objective of protecting the BGI international equity portfolio against a rising dollar. This review did not include an analysis of the value added by individual currency movements but rather the impact of the currency program as a whole on the total portfolio.
- ◆ The program would benefit from the addition to the stated objectives of reference to a specific risk measure (such as standard deviation of returns) and a defined time period.
- ◆ As expected given the objective, the currency program has focused on protecting the portfolio against a strengthening dollar rather than adding value on a weakening dollar.